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February 24, 2016

Department of Conservation
801 K Street, MS-24-02
Sacramento, CA 95814
ATTN: UIC Discussion Draft

Thank you for the opportunity to provide comments on the updated Underground Injection Control (UIC) regulations issued on January 22, 2016 by the Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR). Comments below are divided into two areas; general comments and specific area with recommended language changes (recommended changes are presented in ***bold and/or italics***).

General comments:

1. Will existing UIC projects be “grandfathered” under existing regulations and project approvals or will they be canceled until a new permit has been applied for and granted?
2. If no “freshwater” or USDW is present in the injection project area can the application process and injection project monitoring be somewhat abbreviated?
3. Significant burden on operator for heavy data collection, of which data may or may not be required to be submitted to DOGGR. Rules/regulations should only require data to be collected that would be useful and beneficial to DOGGR in ensuring compliance with final rules.
4. In areas where natural fracturing, fissures and seeps occur there needs to be consideration given for “conclusive evidence” that injected fluids will remain in the zone. There are several areas in western Kern county that are in the middle of producing oil fields that have natural seeps as a result of a natural fracture system. Many of these natural fracture systems, or networks, are in areas with a focus on Diatomite production. Diatomite is a significant resource in California and the proposed rules as written have the potential of causing significant adverse impact on Diatomite production.
5. Recommend that the Division create separate rules/regulations for continuous steam or water injection (flooding or water disposal) versus cyclic steaming operations. As the cyclic injection process for thermal recovery of heavy crude oil is very different from continuous injection (flooding) operations, cyclic processes should not be governed by the same “one size fits all” regulations.

Specific comments:

1720.1 –

(a) “Area of review” means an area that includes a radius around each injection well that is part of an underground injection project.

(1) The radius shall be ~~at least the average of three different~~ calculated lateral distances in which the pressures in the injection zone may cause the migration of the injection fluid or the formation fluid out of the intended zone of injection;

(A) Acceptable methods of calculating the radius of influence will be:

(i) SPE Monograph Series Vol. 7 “Thermal Recovery”, Michael Prat, 1982;;

(ii) Gozde and Chhina, cyclic steam stimulation model, SPE Paper 18807;

(iii) Full field simulation model such as “CMG Stars”;

(iv) Or as may be approved by the Division if a different method is proposed by the operator.

(2) The radius shall be at least:

~~—(A) One quarter mile for an injection well that is not a cyclic steam; or~~

~~(B) 300 feet for an injection well that is a cyclic steam well.~~

As determined by accepted engineering practices the radius of influence for a cyclic steam well is significantly less than 300 feet, this number is not acceptable. Engineering methods take into account time of injection, volume of steam injected, rate of injection as well as standard reservoir parameters (porosity, permeability and saturations).

1720.1 –

~~(b) “Surface expression” means a flow of fluid or material to the surface that is not through a well and that is caused by injection operations.~~

~~—(c) “Surface expression containment measure” means an engineered measure undertaken in accordance with all state and local requirements to contain or collect the fluids from a surface expression, including but not limited to subsurface collection systems, collection wells, cisterns, culverts, French drains, collection boxes, or gas hoods or other gas collection system.”~~

Recommend that these definitions to be struck from the rules due to the fact that “surface expressions” are not referred to anywhere in the proposed rules/regulations.

1720.1(e) – “Underground injection project” means sustained or continual injection into one or more wells over an extended period in order to add fluid to a zone for the purpose of enhanced oil recovery, disposal, or storage. Examples of underground injection projects include waterflood injection, steamflood injection, **cyclic steam injection**, injection disposal **of Class II fluids**, and gas storage projects.”

As cyclic steaming is not sustained or continual injection it should not be considered as an underground injection project.

1724.6(c) – The Division will review underground injection projects to verify adherence to the terms and conditions of the Project Approval Letter, and will periodically review the terms and conditions of the

Project Approval Letter to ensure that they effectively prevent damage to life, health, property, and natural resources.

Recommended language for review of projects; “The Division will review *at regular intervals, not to be less than a twelve month period*, underground injection projects *and the corresponding Project Approval Letter* to verify adherence to the terms and conditions of the Project Approval Letter. *Purpose of the review* of the *injection project and corresponding* Project Approval Letter *is* to ensure that *protection to* life, health, property, and natural resources *is being maintained*.

“1724.7(a)(1) – An engineering and geological study demonstrating that injected fluid will not migrate out of the approved zone or zones through another well, ~~geologic structure, faults, fractures, or fissures~~, or holes in casing, including but not limited to:”

Many formations have naturally-occurring faults, fractures and fissures that will result in migrations out of the approved zone. This requirement, as drafted, would result in serious constraints or prohibitions for future Diatomite production.

1724.7(a)(1)(B) – “Reservoir characteristics of each injection zone, such as porosity, permeability, average thickness, areal extent, fracture gradient, original and present temperature and pressure, and original and residual oil, gas, and water saturations. The scope of the geologic characterization shall encompass the intended reservoir rock and sealing mechanisms, the vertical interval above and below the intended reservoir, areas where fluid could potentially migrate, and the areas adjacent to the intended reservoir where potential entrapment of migrated fluid could occur.”

Level of detail is excessive, recommend the following language; “Reservoir characteristics of each injection zone, such as porosity, permeability, average thickness, areal extent, fracture gradient, ~~original and~~ present temperature and pressure, and ~~original and residual present~~ oil, gas, and water saturations. The scope of the geologic characterization shall encompass the intended ~~reservoir rock injection zone. and sealing mechanisms, the vertical interval above and below the intended reservoir, areas where fluid could potentially migrate, and the areas adjacent to the intended reservoir where potential entrapment of migrated fluid could occur.~~” The geologic study will identify the sealing formation above and below the intended injection zone and will identify sealing mechanisms within the area of review as identified in 1720.1(a).

1724.7(a)(1)(D) – “A map of the area of review showing the location and status of all wells within and adjacent to the boundary of the area of review. The wellbore path of directionally drilled wells shall be shown, with indication of the interval penetrating the injection zone of the underground injection project.”

Recommend the following changes; “A map of the area of review showing the location and status of all wells (*accuracy of such location and status based on publicly available records*) within ~~and~~ 50 feet adjacent to the boundary of the area of review *as identified in 1720.1(a)...*”

1724.7(a)(1)(G) – Wells completed in or penetrating through the intended injection zone shall be evaluated for containment assurance for the design of injection operation volumes, pressure, and flow rates. The operator should identify, and the Division confirm, wells which may require integrity testing or well logging in order to meet the integrity demonstration. ~~The Division may select plugged and abandoned wells to be re-entered, examined, re-plugged and abandoned, or monitored to manage identified containment assurance issues prior to approval of injection.~~

The apparent arbitrary decision of DOGGR to require an operator re-enter P&A'ed wells, and then require the wells to be re-abandoned, will add undue economic hardship on the operator. Problems could occur if wells to be re-abandoned have mechanical failures that will not allow re-entry or if the well(s) in question are not on the applicant's lease.

1724.7(a)(2)(A) – “Structural contour map drawn on a geologic marker at or near the top of each injection zone in the project area, indicating **known** faults and other lateral containment features **that are known to be present within the area of review.**”

1724.7(a)(2)(C) – “At least one geologic cross section through at least one **proposed** injection well **location** in the project area.”

Note: if this is a proposed UIC project application there may not be any injection wells drilled through which a cross section can be generated.

1724.7(a)(2)(H) – “Location and depth of each water-source well that **may** be used in conjunction with ~~the~~ **a waterflood or steamflood** project. **This requirement will be waived for Class II disposal well projects**”

1724.7(a)(6) – “Examples of such data are: **isogor maps**, water-oil ratio maps, isobar maps, equipment diagrams, and safety programs.” **Many professionals in the oil and gas business were consulted and none could explain an “isogor map”, please provide definition.**

1724.7(a)(3)(A) – “A map showing **location of the** injection facilities.”

Note: a map showing the location of the injection facilities in relationship to the overall project area will be much more useful to the Division than a detailed map of the injection facilities.

1724.7(a)(3)(D) – “Method of injection.” **It is not clear what this statement is meant to provide. Does this mean well bore configuration (i.e. tubing with a packer) or is this looking for something else, please provide details.**

1724.7(c) – All data filed with the Division under this section shall be submitted electronically **in a format that is compatible with the Division's database that is in place at the time data is filed** and in paper form.

1724.1(a)(1)(F) – “Sizes and weights of casing;”

Recommend change to; *“Outside diameter size in inches and weight in pounds per foot for all sections of casing;”*

1724.7.2 – Recommend adding a sub paragraph *“(c) The injection fluid analysis specified above will apply to waterflood or water disposal projects only; steam injection projects will be required to have a geochemical analysis only.”* As steam is generated from soft water that is treated prior to generating, the extensive list of chemical constituents is not warranted.

1724.7.3 – *Recommend adding a subparagraph “(d) For injection zones with a permeability greater than one (1) Darcy DOGGR may waive a Step Rate Test.”* In a high permeability reservoir the ability to achieve a sufficient rate and pressure to demonstrate a “pressure falloff” would require very high horsepower and high rate pumps utilizing extraordinary volumes of water, if it would even be possible.

1724.10(g) – Recommend adding subparagraph; *(3) When injection is occurring in an exempt aquifer and in the absence of a freshwater and a USDW.”*

1724.10(i) – Please review comments submitted by the California Conservation Committee of Oil and Gas Producers. LINN supports these comments with respect to determination of maximum allowable surface pressure (MASP). LINN has great concerns regarding the last line of this paragraph, “The Division may approve a higher maximum allowable surface injection pressure based on a conclusive demonstration by the operator that the injected fluid will remain confined to the intended zone of injection.” The nebulous phrase “conclusive evidence” could essentially preclude production from any formations with naturally occurring faults, fractures or fissures, i.e. Diatomite formation, that require a higher surface pressure than allowed under the proposed MASP language. We respectfully request to have a dialog on this matter so that nearly 20% of the State’s production will not be at risk of being shut-in.

1724.10(j) – A mechanical integrity test (MIT) must be performed on all **continuous** injection wells to ensure the injected fluid is confined to the approved zone or zones, **cyclic steam injection wells will be exempt** . An MIT shall consist of a two-part demonstration as provided in ~~subsections~~ subdivisions (j)(1) and (2).

1724.10(j)(2) The second test of a two-part MIT shall demonstrate that there is no fluid migration behind the casing, tubing, or packer. This may be done by temperature survey, radioactive tracer, or noise log performed in accordance with Section 1724.10.1, or other method approved by the Division. ~~{3}~~ The second part of the MIT must be performed within three (3) months after **continuous** injection has commenced. Thereafter, ~~water disposal~~ **continuous injection** wells shall be tested at least once each year, or on a testing schedule approved by the Division based upon consideration of the age of the well, geology, and operational factors; ~~waterflood wells shall be tested at least once every two years; and steamflood wells shall be tested at least once every five years,~~ **cyclic steam wells will not be required to conduct the second part of the MIT.** Such testing for mechanical integrity shall also be performed following any significant anomalous rate or pressure change, or whenever requested by the Division. The second part of the MIT is not required if the injection well is inactive, but shall be performed within three months after recommencing injection. ~~The second part of the MIT is not required for a cyclic steam well that has never~~

~~injected more than 100 gallons per foot~~ appropriate Division district deputy. The MIT schedule may be modified by the district deputy if supported by evidence documenting good cause.

An MIT test on cyclic steam wells will put an unnecessary economic hardship on the operator and will not yield any beneficial information, this test should only apply to water or steam flood wells and disposal wells, i.e. wells that are on continuous injection, not cyclic. The phrase “cyclic steam well that has never injected more than 100 gallons per foot” has no meaning and should be struck.

1724.10(k) – Please note changes as indicated:

(k) Injection wells and related facilities shall be ~~continually~~ monitored **at a minimum once a day** in order to allow for the discovery and correction of abnormal operating conditions, as follows:

(1) Wellheads, well safety systems, well piping and site locations shall be inspected for operability, leaks and mechanical or other ~~fault-failure~~.

(2) Wellhead injection pressure and injection flow rate shall be monitored for unexpected changes indicative of a ~~mechanical~~ **fault-failure**.

(3) Monitoring well pressures or fluid levels shall be monitored for unexpected changes indicative of mechanical ~~fault-failure~~.

1724.10(l)(6) – “The well has been inactive, **not producing or injecting**, for more than two years”.

Note: many older cyclic steam wells might produce for two or three years without a steam cycle being conducted on the well. Existing language would require approval for a steam cycle even though the well is an active producer.

1724.10.1(a)(3) – “The casing valve must be opened during testing and there must be no **sustained** fluid flow. If fluid flow continues from the casing valve, the casing-tubing annulus shall be evaluated.”

An allowance must be made for flow resulting from the potential of thermal expansion causing an intermittent flow during the test.

1724.10.1(a)(4) – “Gamma ray ~~detector~~ **logging tool** sensitivity shall be set so that lithologic effects are ~~just~~ identifiable.”

1724.10.1(b)(2) – “The logging tool shall be calibrated to the ~~extent-feasible~~ **tool manufacturer’s standards**.”

1724.11(a) – this section needs to be re-numbered; it has sub-sections 1, 2, 4, 5..., **there is no #3**.

1724.11(a)(2) – ~~“A failure, breach, or hole in the well tubing or packer;”~~

This section is recommended to be struck because a failure of the tubing or packer does not constitute a failure in the integrity of the well casing or an immediate well failure that would threaten or result in environmental damage or risk human health.

I appreciate DOGGR taking the time to review and give consideration to the comments presented above. It is very important for the wellbeing of the California oil and gas industry and for the diligent administration by DOGGR in executing Division 3, Chapter 1, Article 3106(d) of the Public Resource Code that will encourage the wise development of oil and gas resources in the State. LINN promotes the concept that DOGGR provide revised rules/regulations that will result in a clear distinction between cyclic steaming operations and continuous injection projects, allow continued development of Diatomite resources and only collect data that will add value to the Division's project review and oversight in accomplishing the stated goal of preventing, as far as possible, damage to life, health, property, and natural resources.

Regards,

A handwritten signature in cursive script, reading "Trent R. Rosenlieb". The signature is written in dark ink and is positioned below the word "Regards,".

Trent R. Rosenlieb, P.E.
Manager, Government and Regulatory Affairs